Discussion of San Joaquin River System Presented to BDAC
at its April Meeting by Alex Hildebrand

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Introduction

The purpose of this discussion is to acquaint the BDAC with the San Joaquin River System; its geography, the decline in river flow, the rise in river salinity, the causes of these degradations, and ways in which the degradations can be reversed primarily by more multiple use and reuse of water.

The attached map shows the river system from the tributary dams to the central Delta. It also shows the export canals, and Salt and Mud Sloughs. These sloughs convey to the river the drainage from those wetlands and agricultural lands in the San Joaquin watershed that receive water from the Delta Mendota Canal.

Historical Conditions versus Current Conditions

Prior to 1950 there was almost always an inflow of the river to the Delta that was adequate to reach the central Delta, and the salinity of the river almost never, and perhaps never, exceeded 400 parts per million (ppm) of total dissolved solids. This compares to the State's salinity standard of 500 ppm at Vernalis which has been in effect for several decades but which is now often substantially exceeded.

An attached graph shows the decline in river flow that has occurred since 1900. The flow reduction did not become a problem until after 1950. The reduction in inflow since 1950 has been about two million acre feet per year. In June 1980 the Bureau of Reclamation and the South Delta Water Agency published a joint technical report on the "Effect of the CVP on the Water Supply in the South Delta". The report established that the CVP causes an average reduction of 553,000 acre feet in San Joaquin inflow, of which 345,000 is in the irrigation season. This is shown on attached Table V-18. The rest of the reduction is due to a five fold increase in exports from the Tuolumne River to the Bay Area, and to urban growth, and to increased production of food by increased consumptive use of river system water.

There are now about three times as many Californians to feed and clothe as there were when the CVP was built in the San Joaquin Valley in the late 1940s. Genetic improvements in crops have now resulted in substantially more production per acre. However, this increased yield consumes more water per acre. It takes a fairly uniform amount of water taken up through the roots and evaporated through

Note: There was no text for the extemporaneous discussion. This memo covers the same material.

a plant's leaves in order to grow a pound of biomass of a given food crop in a given climate.

The increase in river salinity is almost entirely due to operation of the CVP. An attached bar chart (SDWA-WQCP-21) shows the annual tonnage of salt that is in the water that is diverted from the Delta and delivered via the Delta Mendota Canal (DMC) to the wetlands and agricultural lands that then drain to the river. The imported salt load is about one million tons in years of full delivery. The consumptive use of this water then concentrates this salt so that the drainage waters enter the river with salt concentrations of 3000 to 5000 ppm. These salts are mixtures of salts with different chemical compositions. The chemistry of the mix, therefore, serves to track the flow of the salt. An attached diagram (SL9) shows, for example, that about 80,000 tons of sulfate ion was imported via the DMC in the year shown, and that about 48,000 tons of this ion drained into and then back down the river to the Delta. A similar diagram can be made for any major constituent and even for boron. The imported salt that does not reach the river salinizes the soils and groundwaters in the CVP service area and will eventually destroy the production in that area.

The soils in the CVP westside service area were derived primarily from marine shales. The application of imported water to these soils leaches trace quantities of heavy metals where the dry climate did not leach away these metal salts by historical precipitation. These elements are present in the ocean and were in the stream system historically, but only with very substantial dilution. There is presumably some interchange between other ions of imported and leached salts.

An effect of both the CVP and State Water Project (SWP) export pumps is to draw down the depth of water throughout the South Delta (see attached Table VII-6) and, in combination with the reduced flow, to create water circulation problems and stagnant channel reaches. Some South Delta channels are very shallow. The drawdown, therefore, makes them too shallow for operation of agricultural diversion pumps during low tides.

With the present California population and twenty million more forecasted in two to three decades we can not afford to lose agricultural production or urban water supplies. We must, therefore, solve these problems to the extent feasible by better salt management, water level control, and more multiple use and reuse of water.

Methods of Overcoming These Problems

The water level and circulation problems in the South Delta can be corrected by installation of the three tidal flow control barriers proposed by the Department of Water Resources, the Bureau of Reclamation, and the South Delta Water

Agency. They restore water depth and circulation. They also prevent the reverse flow in the river south of Stockton which is a primary cause of inadequate dissolved oxygen in that reach for fish. Furthermore, they substantially reduce the extent to which the drainage salts in the river are drawn to the CVP pumps and reexported down the DMC.

There must be a valley drain to take the imported salt to the western Delta or the ocean at a location where the receiving water is as saline as the drainage and where rapid dispersion will occur. Pending such a drain the west side drainage must be ponded and/or held subsurface during low river flows and then released to the river in a controlled manner so as to take advantage of dilution that is available from releases for fish flows, power releases, etc. This will make multiple use of these available dilution waters and avoid the need to release New Melones water for dilution. Those New Melones waters are needed for other uses.

During April 15 to May 15 large river flows for fishery are now required by the 1994 Accord and by the Bay/Delta Control Plan. Some of this flow will derive from minimum flows needed in the tributaries. The balance of flow needed for endangered species protection and for in-Delta flow needs can be supplied by releases from the DMC through its connections to the river. During that period the export of Sacramento water across the Delta is greatly curtailed. The water released from the canal can, therefore, be recaptured in the Delta and reexported down the DMC. This reuse of water by recirculation can relieve the water supply burden on the overcommitted river system to a degree that is equivalent to building a large new dam. Recirculation may be possible to a lesser degree at other times.

The South Delta Water Agency on April 26 submitted to the State Water Resources Control Board an implementation plan for the 1995 Water Quality Control Plan which includes these proposals and complies with all requirements and priorities in State water laws.

6 attachments





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